

ABOUT THIS MAP

Figure 4.13 shows at-sea sightings and survey effort of northern elephant seals (*Mirounga angustirostris*), along with the locations of rookeries in the study area. At-sea observations are based on combined data of several studies (see “Data and Analyses” section of this chapter). For context, the amount of combined survey effort (km of trackline) is also shown, summarized in 10'x10' cells. Dark blue lines indicate the National Marine Sanctuary boundaries of Cordell Bank, Gulf of the Farallones, and Monterey Bay; bathymetric contours for the 200 m and 2,000 m isobaths are also shown in light blue.

DATA SOURCES AND METHODS

At-sea sightings and effort for the northern elephant seal are based on the CDAS central California data set (2003), developed using software called Marine Mammal and Seabird Computer Data Analysis System (CDAS), by the R.G. Ford Consulting Co. This data set contains data from eight survey programs (five aerial surveys, three ship surveys) conducted between 1980 and 2003; the data extends from Pt. Arena to Pt. Sal in the study area. See the Data and Analyses section of this chapter for information on the at-sea survey data sets and mapping methods used.

Information on rookery locations and sizes was obtained from Brian Hatfield, USGS; Joelle Buffa, FWS; William Sydeman, PRBO Conservation Science; Pat Morris, UCSC; Richard Condit, Smithsonian Institution and Sarah Allen, National Park Service.

RESULTS AND DISCUSSION

The northern elephant seal breeding population consists of two populations (or stocks); the U.S. stock in California and the Baja California, Mexico stock (Carretta *et al.*, 2002; Carretta *et al.*, 2006). Because all age classes are not ashore at the same time, a complete population count of elephant seals is not possible. Based on an estimate of pups born in 2001, the California stock in 2001 was 101,000 seals (Carretta *et al.*, 2006). Current trends in pup counts of northern elephant seal colonies in the U.S. continue to increase throughout their range in California, but appear stable or decreasing in Mexico (Carretta *et al.*, 2006).

The northern elephant seal is present year-round in the study area; however, because they spend very little time at the surface and forage mostly offshore, at-sea sightings are rare, as evidenced by the relatively few sightings in the CDAS data set in the study area (n=278 sightings; n=285 individuals). Therefore, insufficient data precluded mapping the at sea sightings for northern elephant seal by season.

Northern elephant seals were widely distributed in the shelf, shelf-break, and slope habitats within the three national marine sanctuaries, and also in deep ocean habitats seaward of the 2,000 m isobath. They also occurred well to the north, west, and south of sanctuary boundaries. In the CDAS data sets, age classes of at-sea sightings of seals are unknown.

The northern elephant seal breeds, gives birth, and molts on islands and coastal regions in California, as well as offshore islands of Baja California. The breeding period in the study area is generally December through March (Stewart and Huber, 1993); pupping occurs three to six days after the female arrives at the rookery and lactation is about 22 – 29 days. Molting occurs April – August; females and juveniles molt in April-May; subadult males molt in May/June, and adult males molt in July/August; and yearlings molt in the fall. In the study area, northern elephant seals migrate between rookeries (within sanctuary boundaries) at the Farallon Islands, Point Reyes, Año Nuevo Island and the adjacent mainland, Piedras Blancas, and Cape San Martin. They also migrate to the north, where they spend eight to ten months of the year feeding. Adult males feed in the eastern Aleutian Islands and the Gulf of Alaska; adult females feed to the west and south of 45° N in deep, oceanic water (Le Boeuf *et al.*, 1993; Stewart and Huber, 1993; Stewart *et al.*, 1994).

At the five rookery sites in the study area, there are three peaks in abundance: 1) during the breeding/pupping season mid-December to mid-March, with peaks in pupping in late January; 2) during the molting season when females and juveniles are on shore from April to May; and 3) when yearlings and juveniles are on-shore September - November (S. Allen, pers. comm.; LeBoeuf and Laws, 1994).

Chapter 4: BIOGEOGRAPHY OF MARINE MAMMALS

Pups depart the pupping sites during the Upwelling Season and tagging studies indicate that pups from this region travel as far as Alaska (S. Allen, National Park Service, unpublished data); see also www.topp.org - Tagging of Pacific Predators.

Each year at Año Nuevo Island and the adjacent mainland, there are approximately 2,400 females and 300-400 males present, and approximately 2,200 pups are produced (Morris, pers. comm., 2003). Based on pup counts, the population there steadily increased through the mid 1990s, but now appears to be stable (Morris, pers. comm., credited to B.J. Le Boeuf). In 2004, 2,035 weaners were counted on Año Nuevo Island and mainland, and all live counts during February 2004 tallied 3,875 animals (Morris, pers. comm., 2006).

In contrast, the colony at Piedras Blancas has generally continued to increase (Hatfield, pers. comm.). In 2004, 3,000 pups were counted and the estimated number of elephant seals that use this colony is 10,500 – 13,500. To the north, at Gorda (Cape St. Martin), 300 pups were counted in 2004, and the estimated numbers that use the Gorda colony is 1,050 – 1,350. Total population at Pt. Reyes was estimated to be 2,000 in 2006 (S. Allen, pers. comm.).

Overall, productivity has declined at two major breeding sites on Southeast Farallon Island (Sydeman and Allen, 1999; Nusbaum, 2002), with erosion playing a major role in limiting the species' population (USFWS, 2000). In California, the net productivity rate for northern elephant seals also appears to have declined in recent years (Carretta *et al.*, 2002). However, the colony at Point Reyes Headlands has continued to increase by 5-10% per year (Sydeman and Allen, 1999; Allen, pers. comm., 2003).

Due to the high surf during the strong El Niño of 1998, extensive pup mortality occurred at the Point Reyes colony (Petree, 1999), but also forced the relocation of the breeding area; some moved from the main colony at Point Reyes Headlands to South Beach and North Drakes Bay Beach (Petree, 1999). During winter counts in 2003-2004, maximum adult elephant seals at Pt. Reyes (North Drakes Beach, Pt. Reyes Headlands, and South Beach) were 123, 483, and 35, respectively. In 2005-2006, maximum counts (based on direct counts) of adult elephant

seals during the winter breeding season at Pt. Reyes (North Drakes Beach, Pt. Reyes Headlands, and South Beach) were 295, 459, and 79, respectively. The estimated number of pups born in 2006 at these three areas was 746 (S. Allen, pers. comm.).

Northern elephant seals have been known to haulout at other sites (e.g., Grimes Point), but only haulouts/rookery sites from 2003-2004 are shown on the map. Other rookeries/haulout sites south of the study area are located at the Channel Islands on San Nicolas Island, Santa Barbara Island, and San Miguel Island, and off Baja California, Mexico on Isla San Benito, Isla de Guadalupe, Isla Cedros, and Isla Los Coronado.

Human related sources of mortality include: takes from drift gillnet fisheries for swordfish and sharks (from both the U.S. and Mexico population), set gillnets (number of set gillnet vessels off Baja is unknown), hook-and-line fisheries, boat and automobile collisions, and illegal shooting (Carretta *et al.*, 2002; Carretta *et al.*, 2006).

Northern elephant seals are capable of prolonged deep dives and feed on deepwater fishes and invertebrates, including Pacific hagfish (*Eptatretus stouti*), ratfish (*Hydrolagus colliiei*), Pacific hake, rockfish, sharks, rays, crab, squid, octopi, and euphausiids (Antonelis, Jr. *et al.*, 1987; Condit and LeBoeuf, 1984).